THE
Journal of Home Economics

VOL. XI APRIL, 1919 No. 4

CHANGES IN FOOD VALUE OF VEGETABLES DUE TO COOKING*

EFFECT OF VARYING HOUSEHOLD MANIPULATIONS

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I. INTRODUCTION

Recent progress in nutrition is emphasizing heavily the inadequacies of a diet with a preponderance of cereal products and vegetable fats—our cheapest sources of protein and calories—at the same time that food scarcity puts some of their most effective supplements, such as eggs, milk, meat, and animal fats, very nearly out of the reach of all except the well-to-do classes. It seems that many of the fresh vegetables and fruits have some value, in several respects, as supplements to inadequate diets of certain types. But at most seasons of the year these, too, are considered to be out of reach of the limited purse, with a few exceptions, prominent among which are vegetables which may be canned in time of plenty, and the "winter vegetables." If these local products are to be more largely used in the diet, both as supplements to the cereals and meats and as substitutes for them, an extended knowledge of their value with regard to various dietary factors is desirable. This study is concerned with the factors which are usually the first ones to be determined—their fuel values and ash content—these being determined from the vegetables as served to us at the table, after household manipulation, possibly also after commercial manipulation, as in the case of canned foods.

With the exception of potatoes, the winter vegetables are mostly strong-juiced or highly flavored, and their flavors do not commend themselves to all persons, particularly often not to those of highly dis-

* This paper was presented as part fulfillment of the requirements for the degree of Ph.D. in Household Administration, University of Chicago, August, 1918.

criminating or of irritable nervous organizations, unless the flavor can be somewhat modified. Partly for this reason and partly for purposes of convenience, the methods very generally employed in cooking and in canning them have involved the use of a greater or less excess of water, which has considerable extractive power at the temperatures employed. Food conservationists are urging that these vegetable foods should be baked, or steamed, or boiled in their jackets, or that the vegetable stock should be utilized; yet practical objections, such as those in the following list, continue to be urged upon some occasions.

1. It is apparent that neither cabbage heads nor large root stalks can be boiled whole,—their size forbidding this possibility.

2. Chlorophyl-bearing tissue usually turns more or less brown when steamed, though boiling water (even distilled, but especially when "hard" or when salted or made alkaline with soda) satisfactorily "sets" the green color of cabbage, cauliflower, Brussels sprouts, peas, string beans, and the yellow color of blanched celery. If the cooking be not too long continued, this green color is satisfactorily retained in boiled vegetables.

3. The steamed product is dryer and less water-logged than the boiled, and of different texture; it has of course no flavor of added salt, and yet (steamed at 90° to 100°C.) it may retain its characteristic odor and taste more strongly than does the boiled vegetable. The consequence is that the uninitiated frequently pronounce steamed cabbage both rank and insipid, also "not done."

4. The washing of spinach or greens which have been transported for long distances "packed in mud" (cracked ice) is a tedious process and often more or less of a failure, even when a good deal of pains has been taken. Under these circumstances it is a great help to boil in excess of water and skim out the greens when done, because thus the remaining sand and grit fall to the bottom of the kettle, instead of sticking to the leaves, as is the case with the steamed product.

5. The strong taste of condensed spinach juice, such as is produced by cooking the leaves in a very small amount of water, proves objectionable to many persons, including children not old enough to express themselves verbally upon the subject.

6. Baking is desirable, yet often impracticable for various reasons, among which are the expense of fuel, and the overheating of the kitchen from the oven.

7. Home and commercial canning methods alike usually call for a preliminary "blanching" process which is advisable for various reasons; yet

this period of boiling in excess of water, which apparently is never utilized to advantage, seems inconsistent with our customary efforts to "save the juice." (This objection does not apply to the steam blanch or to blanching in skins.)

8. The vegetable canned in excess of water at high temperature, as are some of the commercially prepared products, may well lose a large part of its nutrient values of various sorts to the "juice" drained off when the can is opened; yet this juice, especially when excessive in amount, is often not palatable, and is feared by some because of its possible content in tin, lead, or iron salts derived from a metal container.

9. The cook often finds it a convenience to pare vegetables and cut them ready for serving, early in her preparation of the meal. She does not wish to add peeling of potatoes or carrots to the list of things which must be done in the busy period just before the meal is served when the biscuits are to be baked and the coffee to be put over, the gravy to be made, and the salad to be dressed. She therefore objects to cooking vegetables in their skins.

10. The use of a large rather than a small amount of water with vegetables shortens the period of their cooking to such an extent that the average home cook often prefers to use an excess of water rather than barely water to cover.

Thus it would appear that a single generalization does not suffice to dispose of all cases, but that the cooking of each vegetable is a question to be decided on its own merits, if the conservation of nutritive value is to be combined with maximum palatability and practical convenience.

Other questions which occur to the dietitian who compares the cooked vegetable with the raw, are such as these: After careful consideration of the details of every-day practice to be observed all about us, how are we to estimate the dietetic value of vegetables cooked in diverse ways? Shall we in computing or planning dietaries, assign to the cooked vegetable 90 per cent or 75 per cent or 50 per cent of the caloric value of the edible portion of raw vegetables? What is the proportionate loss sustained by vegetables which have been "blanched" in excess of unsalted boiling water, as practiced in some canning processes; by vegetables covered with water and cooked in quart jars in bath of boiling water for two and three hours, as recommended for home canning? Does the vegetable with high content of soluble carbohydrate lose proportionately more than that with lower content? Does the root stalk cut into large pieces suffer considerable loss? Do uncut vegetables which present a

large amount of exposed cuticle (leguminous seeds, leaf greens, fleshy buds and flowerets as loose-leaved cabbage and cauliflower) suffer considerable loss from the extractive effect of boiling water? Are the losses from steaming at 90° to 100°C. (efficient home steamer) negligible; are those from direct exposure to steam at 100° to 120°C. (institutional cooker) also negligible? Does the addition of salt to the cooking water, in small amounts (1.5 per cent solution at beginning of process) increase or diminish the cooking loss? Does the loss diminish if sectioning be done longitudinally (parallel with the fibro-vascular bundles) rather than crosswise (across them, exposing their cut ends at both surfaces of each slice to the solvent action of water)?

II. REVIEW OF LITERATURE ON LOSSES IN COOKING VEGETABLES

Most of the work done on losses of cooked vegetables is concerned chiefly with mineral constituents. In many cases very few details as to method of cooking are given, which makes it difficult to compare results of different investigators.

Wagner and Schaefer[1] reported finding that potatoes steamed in their skins lost 1.17 per cent of their crude ash, 0.69 per cent of their potassium, 0.03 per cent of their phosphorus. Steamed after paring, these losses were 7.28 per cent, 6.93 per cent, and 4.57 per cent, respectively. Boiled in their skins, they lost 3.64 per cent of their crude ash, 3.32 per cent of their potassium, 1.12 per cent of their phosphorus; boiled after peeling, 28.86 per cent, 38.33 per cent, and 22.87 per cent, respectively. 1 kgm. of spinach lost 8.578 grams of dry matter (1.684 gram N, 3.375 grams of ash); 1 kgm. of carrot tops, chopped, lost 15.252 grams dry matter (3.312 grams N, 6.331 grams ash). Average losses in boiling were 9 to 18 per cent of the total soluble matter found in the unboiled vegetable food.

Snyder, Frisby, and Bryant[2] found that potatoes when pared, soaked 3 to 5 hours, and put over to cook in cold distilled water, lost 46 to 58 per cent of their total nitrogen (about one-half of which is in the form of protein), 25 per cent of their protein, and 38 per cent of their mineral salts. When pared, put into either hot or cold distilled water, and cooked at once, the losses were half these amounts or less; when cooked in skins, the nitrogen loss was 1 per cent, the protein loss 0.5 per cent, the

[1] Sachs, *Landw. Ztschr.*, vol. 33, p. 369, 1885. (Abstr. in *Jahresb. f. Agrikultur. Chem.*, N. F. 8, vol. 28, p. 443, 1885.)

[2] Bull. 43, Office of Exp. Sta., U. S. Dept. Agr., 1897.

mineral loss 3.3 per cent. Frisby and Bryant, in another experiment, found that pared potatoes, put into cold distilled water and cooked, lost 9.2 per cent of their nitrogen, 2.7 per cent of their carbohydrate, and 17.2 per cent of their ash; when cooked in their skins, they lost 1.6 per cent of their ash. Varying the experiments by using "alkaline water" or "lime water," instead of distilled, produced no important variations in losses—except that it seemed that the lime water (and the cold alkaline water) took out a little more protein than did the distilled water controls. Carrots, scraped and cut into pieces, lost from 20 to 40 per cent of their nitrogen, and from 29 to 47 per cent of their ash, according to size of pieces. Half a solid cabbage, put into cold water and cooked, lost from 33 to 46 per cent of its nitrogen, 33 to 42 per cent of its fat and carbohydrate, 48 to 54 per cent of its ash; put into hot water and cooked, the losses were usually (but not always) a little less. On the whole, the alkaline and lime waters had a slightly greater extractive action than did the distilled water.

Kraus[3] found that cabbage turnip when cooked had lost 20 per cent of its carbohydrate; cauliflower, 33⅓ per cent; spinach, 71 per cent; winter cabbage, 53 per cent.

Zschokke[4] worked on losses in "blanching" (boiling in hot water) of carrots (cut in pieces), peas, string beans cooked whole and also cut into pieces. In each case, one-half of the vegetable was steamed and the other half boiled for 25 to 30 minutes. The losses in total dry matter were about five times as much by boiling as by steaming; losses in salts, usually only from three to four times as great in boiling as in steaming. He gives no data for raw foods, but, if we were to judge from American analyses for these foods, we should conclude that his losses in protein and mineral salts were markedly lower than those reported by most workers, while his losses in "nitrogen-free extract" run only a little lower than some losses in caloric value reported in the present paper. (He found a loss of 3.43 grams of nitrogen-free extract per 100 grams raw material in boiled carrots, 2.43 grams in boiled peas, 0.624 grams in beans boiled whole, 0.768 gram in beans boiled in pieces.)

Haensel[5] reports a loss of about 0.08 gram of iron oxide from 100 grams of fresh vegetable, in boiling spinach; and 70 per cent of its iron, in boiling lettuce in water—if I have correctly interpreted his report.

[3] *Ztschrf. f. Diät. u. physik. Ther.*, vol. 1, p. 69, 1898. Cited in Hutchison's Food and Dietetics.

[4] *Landw. Jahrb. d. Schweiz.*, vol. 19, p. 615, 1905.

[5] *Biochem. Ztschr.*, vol. 16, p. 9.

Williams[6] gives a number of analyses of cooked foods, calculated to moist condition; but in her earlier articles, no corresponding analyses of raw materials were made, so that it is impossible to judge of the proportionate losses. A later article[7] reports a loss of 10.59 per cent of its protein and 5.36 per cent of its ash, by celeriac, pared, sliced thin, and cooked 30 minutes in boiling water. Chicory, borecole, and endive (procedure not stated) lost from 30 to 43 per cent of their protein and from 12 to 19 per cent of their ash. Dried legumes (butter beans, green flageolets, soy beans), soaked 12 hours and then cooked (whether in the same water, and how much, is not stated), lost into their cooking water 26 to 28 per cent of their protein, and 5.5 to 17.05 per cent of their ash. Chestnuts (evidently fresh) lost 54 per cent of their protein and 7 per cent of their ash. A still later paper[8] evidently reports further work, especially with regard to protein losses. Cooked in boiling water by the usual method, spinach, with 10 per cent of total solids, loses one-fourth of these; celeriac loses half of its total solids (7 per cent of its ash, 54 per cent of its protein); turnips, almost half; lettuce, one-fourth; asparagus, one-sixteenth; curly greens (borecole) 40 per cent (16 per cent of its ash, 54 per cent of its protein); chicory, 20 per cent (12 per cent of its ash, 43 per cent of its protein); butter beans, 10 per cent (19 per cent of its ash, 30 per cent of its protein); endive, 25 per cent (19 per cent of its ash, 30 per cent of its protein).

Maurel and Carcassagne[9] found that blanching for 30 minutes (or 15 minutes? the two reports conflict) in distilled water, removed 40 per cent of the total salts from cauliflower, 44 per cent from Brussels sprouts, 55 per cent from cabbage sprouts, 26 per cent from celery root (celeri pied), 37 per cent from celery leaves, 35 per cent from asparagus, 34 per cent from green beans, 19 per cent from white beans, 33 per cent from lentils, 61 per cent from potatoes. Amounts of potassium lost were in all these cases, except two, relatively high, ranging from 25 to 73 per cent of total potassium. In general, 40 to 50 per cent of total salts (50 to 75 per cent of total potassium) was lost in this blanching process. In the case of legumes, 30 minutes' blanching removed a much larger amount of potassium (73 per cent in white beans, 38 per cent in lentils) than did the remainder of the three hours' cooking (16 and 22 per cent,

[6] *Jour. Amer. Chem. Soc.*, vol. 26, p. 244, 1904.
[7] *Jour. Indust. Eng. Chem.*, vol. 5, p. 653, 1913.
[8] *Chem. News*, vol. 113, p. 143, 1916.
[9] *Compt. rend. Soc. Biol.*, vol. 67, p. 91, 211, 1909.

respectively). These authors also quote Laborde[10] as finding a loss of 75 per cent total salts (60 per cent of potassium) in the blanching of cabbage; and Labille[11] as reporting losses of 29, 70, and 54 per cent of total potassium for 5 minutes' blanching of green beans, sorrel, and spinach, respectively; also, loss of 36 per cent of potassium in 10 minutes' blanching of potatoes.

Poppe[12] cooked (or soaked) fresh green peas in two and one-half times their own weight of water or liquid, for 1 hour at 100°C., for two hours at 50°C., for 24 hours at 20°C. They used seven liquids—distilled water, saturated NaCl solution (56 per cent), half-saturated, and quarter-saturated (10 per cent NaCl), saturated sugar solution (about 105 per cent), half-saturated, and quarter-saturated (18.4 per cent). They found that the peas boiled in distilled water lost 10 per cent of their nitrogen (it seems the raw peas contained 19 per cent of protein), 13.6 per cent of their carbohydrate (6.92 per cent carbohydrate in raw peas), 3.9 per cent of their phosphorus (0.66 per cent in raw peas), none of their chlorine. The salt solutions removed less of the nitrogen than did distilled water, and very little phosphorus or carbohydrate; the stronger salt solutions removed less nitrogen, in general, than did the weaker, but there was little difference in their extractive effect on carbohydrate. All losses were, as a rule, greater at the higher temperatures, because these kill the protoplasm and convert it from a semi-permeable membrane to a permeable one, whereas at 20°C. the living protoplasm, though it imbibes water, is able to regulate its loss of solutes and the entrance of solutes from its environment, to a considerable degree. The peas took up about 1 per cent of their own weight in salt from the boiling quarter-saturated salt solution, and about 1.5 per cent of their own weight of sugar from the boiling quarter-saturated sugar solution. It is not stated whether the solutions were kept at their original strength by renewal of water as they boiled, or whether they became more concentrated as cooking proceeded. Unfortunately these most careful and scientifically made observations can apply only somewhat remotely to the problem of cooking losses, since solutions as strong as these could not be used in preparing vegetables.

Berry[13] found that boiled spinach lost 50 per cent of its salts; boiled

[10] *Soc. d. Hist. nat. Toul.*, March 28, 1900, p. 67.
[11] *Traite de l'Alimentation*, vol. 3, p. 522, 44, 35.
[12] *Bul. Soc. chim. Belg.*, vol. 25, p. 136, 1911.
[13] *Jour. Home Econ.*, vol. 4, p. 405, 1912.

cabbage 40 per cent; boiled carrots (cut in pieces) 11.5 per cent of their salts (23 per cent of phosphorus) and 26 per cent of soluble carbohydrate.

Berg[14] suggests that in some cases the losses in alkali as a result of boiling vegetables are so great that the vegetable may actually lose its basic ash, and come to possess an acid ash.

Bodinus[15] announces that the loss of solids in boiled potatoes is at least 2 per cent if pared. If sodium chloride be added to the water, the loss is 1.25 per cent of the starch and 10 per cent of the potato salts; if no salt is added, the potato loses 33 per cent of its salts.

Morgan[16] reports a smaller loss of salts in peas canned by the commercial process than in those canned by the three-day sterilization home process. (Specifications and detailed results not given.) She found a loss of 18 per cent of the ash (25 per cent of phosphorus) due to blanching.

Blunt and Otis[17] boiled 5 to 10 grams of spinach, string beans, navy beans, and peas, respectively, in 25 to 75 cc. distilled water in a covered beaker for 20 to 40 minutes (navy beans two hours); potatoes were also boiled (seven were scraped, cooked together, and mixed). These vegetables, both raw and cooked, and the cooking water were then analyzed for iron. The losses found were: spinach, between 43 and 50 per cent of its total iron; string beans, between 39 and 43 per cent; navy beans, between 32 and 39 per cent; peas, 36 per cent; potatoes, between 15 and 22 per cent.

Visawanath[18] found that neutral salts (of calcium, magnesium, and sodium) retard, and alkaline salts (e.g., Na_2CO_3) accelerate the cooking of legumes (dhall) because they retard or accelerate respectively, the solution of protein and starch, but more especially of protein.

Courtney, Fales, and Bartlett[19] cooked seven varieties of vegetables by "thorough boiling" for 30 to 150 minutes, and analyzed cooked vegetables and cooking water for calcium, magnesium, phosphorus, chlorine, potassium, sodium, sulphur, iron, and nitrogen. The percentage losses on most salts were greater than losses in calcium and nitrogen. New Zealand spinach was an especially heavy loser (72 per cent of total ash), yet it lost very little of its calcium, and the same thing was true of ordinary spinach. (Both these vegetables are especially good sources of

[14] *Nahrung. u. Genussmittel, Aschbestandteile,* Dresden, 1913.

[15] *Chem. Zentr.*, Bd. 2, p. 37, 1915.

[16] *Jour. Home Econ.*, vol. 7, p. 72, 1915.

[17] *Jour. Home Econ.*, vol. 9, p. 213, 1917.

[18] Mem. Dept. Agri., India, Chem. Ser. 4, No. 5, p. 149, 1916. Abstr. from *Chem. Abstr.*, 1917.

[19] *Amer. Jour. Dis. Children,* vol. 14, p. 34, 1917.

calcium, if one were to judge from chemical analyses alone,—a questionable proceeding.) Carrots, onions, and asparagus lost but a trace of iron; spinach, 28 per cent of its iron; New Zealand spinach 51 per cent. Reducing the time of cooking made little difference in the losses (spinach cooked 10 minutes instead of 90, string beans cooked 60 minutes instead of 150 minutes lost almost as much as before). Steaming, however, reduced the losses materially (spinach only half as much loss as when boiled, asparagus one-third as much, carrots one-fourth as much). New Zealand spinach and onions still lose 20 to 30 per cent of their more soluble constituents, when steamed (for 30 minutes).

Weibull[20] concludes that while potatoes do not lose appreciably if boiled in their skins, they lose 0.5 per cent of their solids if pared before boiling. If sweetened by chilling, they lose 0.5 per cent when boiled in skins, 1.5 per cent when pared before boiling. Cooked in hard water, they retain their solanin; cooked in distilled water, they lose one-third of it.

Wardall,[21] working to develop a method of making vegetables free of digestible carbohydrate for the use of the diabetic, placed the finely cut vegetables in cold water, brought this to the boil, boiled for several minutes, then poured the water off and repeated the process. She found that, while beets give a test for reducing sugar after two such extractions and are then exhausted of such carbohydrate, cabbage still gives the test after 8 extractions, carrots after 6, eggplant after 7, parsnips after 6, pineapple after 9. Extracted in water at 60°C., 1 hour was required to extract all reducing carbohydrate from beets; 1½ hours for carrot; 2 hours for eggplant; 1 hour for parsnips; 3½ hours for pineapple. Cabbage seemed to give up little of its reducing substance to a 60°C. extraction.

†Masters[22] tried the effect of boiling dried beans in a large excess of water (five times their own weight) treated in various ways. She found that soaking the beans overnight reduced the time of cooking only from 2 hours and 5 minutes to 2 hours. (The experience of the author of this paper is very nearly in accord with hers, though there is a good deal of variability among the different kinds and different grades of maturity. If the beans be put directly into boiling instead of into

[20] *Kungl. Landtbruks-akad. Handling ar Tidskrift*, vol. 56, p. 348, 1917. Abstr. in *Chem. Abstr.*, 1917.

[21] *Jour. Amer. Med. Assn.*, December 1, 1917.

[22] *Biochem. Jour.*, Oct., 1918.

† This thesis was prepared in March 1918. The following notes were added in March, 1919, in order to bring the bibliography up to date.

cold water to cook, the time is still further reduced in some instances.) The soaked beans lost a larger proportion of their solids than did the unsoaked (12.2 per cent instead of 10.5 per cent in tap water; 12.6 per cent instead of 11.1 per cent, in distilled water). Salting the water reduced the losses considerably: in 0.25 per cent NaCl, they lost 9.2 per cent of their solids; in 0.5 per cent NaCl, 8.7 per cent; in 1 per cent NaCl, 8.3 per cent. Even the salts of tap water had a slight effect in this respect (11.1 per cent loss when boiled without soaking, instead of 10.6 per cent loss in tap water), when soaking and cooking were not too much prolonged. Adding soda increased the losses; boiled (without soaking) in 0.1 per cent solution of sodium bicarbonate in tap water, they lost 11.3 per cent of their solids; in 0.25 per cent solution, 14.3 per cent; in 0.5 per cent solution, 22.3 per cent; in 1 per cent solution, 27.3 per cent. Disintegration was very rapid at the higher concentrations, and the flavor was such that the beans were uneatable; the most satisfactory results were those when 0.1 per cent sodium bicarbonate was used.

Cooking by steaming was also tried; 100 grams beans were covered with 250 grams boiling water, the basin was placed quickly in a steamer, and closed with a tightly fitting lid. When thus steamed without previous soaking, they lost 8.9 per cent of their solids; soaked overnight and thus cooked, they lost 10.4 per cent; cooked (without soaking) in 0.25 per cent NaCl, they lost 8.4 per cent; cooked (without soaking) in 0.1 per cent sodium bicarbonate and 0.25 per cent salt, they lost 7.8 per cent; cooked in 0.1 per cent soda and 0.25 per cent salt after previous soaking they lost 8.1 per cent of their original weight.

Denton and Kohman[23] fed young white rats raw carrots, boiled carrots with the concentrated cooking water, boiled carrots without the cooking water, and canned carrots (processed two hours in boiling water bath). During the short period (five weeks) when carrots formed the sole diet (except for certain salts which were added), it was clear that those animals fed on raw carrots had the advantage over the others. Difficulties which the animals had in accommodating themselves to the unsuitable diet appeared to be greater, in proportion to the length of time the carrots had been cooked. However all animals rallied and began to improve in time, except those on the canned carrots, who were started later than the rest and had not sufficient time to show what they could do before a change in diet was

[23] *Jour. Biol. Chem.*, vol. 36, p. 259, November, 1918.

made. When protein, fat, and starch were added to the diet in such proportions that the carrots furnished only one-half to two-thirds of the solids and of the calories of the diet, cooking of the carrots seemed to have no deleterious effects. True, however, it was observed that those animals which received carrots with the concentrated juice cooked down to some degree of caramelization did, after a time, fall considerably behind the rest in food consumption and also somewhat in rate of growth. The reason for this difference, which was perfectly apparent to all those who handled the animals and their food, cannot be stated, so far as I know, at the present moment.

Those animals fed boiled carrots without the juice, on the other hand, developed unusually large appetites, though their growth curves were not quite as good as those of animals similarly fed on raw carrots. Presumably this shows the effect of the loss of a considerable portion of the caloric value of the vegetable into the cooking water.

Daniels and McClurg[24] fed young white rats on a diet in which cabbage (raw, or boiled in water or in soda and water, or autoclaved) was the only source of water-soluble vitamine. The cooking water was included in the diet in all cases. The soda was added in the proportion of $1\frac{1}{3}$ teaspoonful per cup of raw beans (33 cc. of 5 per cent solution of sodium bicarbonate to 50 grams of soy beans); and $1\frac{1}{3}$ teaspoonful to 1 pound of cabbage (63 cc. of 5 per cent solution, to 250 grams cabbage); this proportion of soda is about what is very commonly used in cooking these vegetables. Their experiments continued only through one month in the case of cabbage feeding; but it is believed that the effects of a decided deficiency of water-soluble vitamine should be apparent within that time. Yet animals on all of these cooked diets throve equally well with those fed raw cabbage, and all animals kept pace with or exceeded the normal rates of growth. Evidently, then, cooking of cabbage even at high temperatures or even in alkaline medium did not sufficiently impair the water-soluble vitamine so that growth was perceptibly interfered with, under the conditions above described.

It must, however, be noted with respect to the last two investigations reported, that it is possible the results might have been slightly different if the amount of vegetable fed had been reduced to the minimum, or that which would furnish barely sufficient vitamine to meet the needs of growth. In case cooking does have a slightly prejudicial effect on vitamines, it would be more likely to appear when the margin of safety is a narrow one than when it is a very wide one.

[24] *Jour. Biol. Chem.*, vol. 37, January, 1919.

As Miss Daniels remarks, this excessively wide margin of safety in respect to vitamines may perhaps account for the fact that her results are different from those of McCollum and co-workers (Jour. Biol. Chem., Vol. 33, p. 55) who found that the water soluble vitamine extracted from the wheat embryo was apparently destroyed by 60 minutes boiling in alkaline medium.

Stanley[25] gives tables showing losses due to blanching varying from 19 per cent in wax beans to 53 per cent in cabbage. Another table shows 52 per cent of mineral matter lost in boiled spinach, 9 per cent in steamed; 41 per per cent in boiled cabbage, 11.5 per cent in steamed. Details of manipulation are not given.

(To be concluded.)

THE CANNING OF ASPARAGUS[1]

ALICE E. SKINNER AND GRACE GLASGOW

The number of inquiries received by the college in regard to the difficulties experienced in home canning, and especially in the canning of asparagus, indicated a need for some method of canning this vegetable that would give a more palatable product than is obtained by the usual household methods. When asparagus is heated for the period of time usually thought necessary for successful canning, whether the cold pack or the intermittent method is used, it becomes so soft that it is difficult to handle without destroying its shape. Three hours, the length of time often recommended for processing, not only softens the vegetable, but also fails to give results uniform enough from the standpoint of preservation to warrant its recommendation. Periods of processing less than three hours are sometimes successful but the results are so variable that considerable loss from spoilage is not infrequent.

A number of tests were conducted. In part of them the asparagus was blanched for from three to five minutes in boiling water; in others

[25] Cooking of Vegetables. Cir. 1, Agr. Ext. Service, Univ. of Mo., 1915.]

[1] Experiments carried on in the Departments of Domestic Science and Bacteriology, Kansas State Agricultural College.

it was packed in jars without blanching. No advantages in favor of the blanching could be detected save that the shrinkage permitted a fuller pack. In fact in these experiments spoilage was more frequent in the blanched than in the unblanched product.

The tests were conducted with a view to working out some methods that would give uniform results in preservation without rendering the vegetable undesirably soft. As yet we have made no tests with the pressure cooker, the aim being to duplicate as nearly as possible the average home conditions. The water bath used was an ordinary covered kettle, deep enough to hold pint jars when placed on a rack. The asparagus stalks were cut in suitable lengths for the jars and fitted in to utilize the space to the best advantage. Only pint jars were used, as quart jars would necessitate making two layers, which would injure the lower layer of tips. After the pack had been made the jars were filled with boiling water containing salt in the proportion of one tablespoon to a quart of water. Some tests were made in which the quantity of salt used was increased to an amount sufficient to have some preservative action. In other tests dilute vinegar was used.

The first tests were made by simply processing in the water bath for three hours after the water around the jars had begun to boil. Of the three hour tests made, 50 per cent showed spoilage with the production of gas in some cases. Fifty per cent were apparently sound after nine months, although cultures from a number of jars showed the presence of organisms. The effect of this amount of processing is to soften the stalks to an undesirable extent. The flavor, however, does not seem to be impaired. An attempt to avoid the softening by using a shorter period of processing resulted in a much greater percentage of loss. Periods below two hours resulted in a total loss.

In the recommendations of the United States Department of Agriculture through the bulletins of the States Relations Service, the use of a heavy brine is advised in the canning of certain vegetables. This brine is made by using approximately two tablespoons of salt to a quart of water. The period of processing recommended for asparagus is two hours. Tests made according to these directions showed a lower per cent of spoilage than was found where salt was used only for seasoning. The product, however, did not invariably keep.

In another series of tests very dilute vinegar solutions were used, since the spore-forming aerobes, which are the types most often associated with spoilage of asparagus, are sensitive to small amounts of acid.

Where vinegar was used the time of processing was reduced to a period of from one and one-half to two hours with a decided reduction in the softness of the vegetable. The decrease in the percentage of spoilage, as compared with that in jars processed longer but not treated with acid, was very decided. In some of these tests two tablespoons of vinegar containing 4.4 per cent of acetic acid were added to each quart of the water used for filling the jars. In other tests only one tablespoon to a quart of water was used. The two tablespoons of vinegar was sufficient to produce a flavor characteristic and distinct though not to be recognized as acid. The amount of acid was not sufficient to cause any curdling of milk sauces with which the asparagus was subsequently combined. When the asparagus was served with an acid such as French dressing or Hollandaise sauce, the change in flavor due to the vinegar could not be detected.

The results of the tests made with vinegar indicate that two hours of processing is sufficient to keep the vegetable if a solution containing one tablespoon of vinegar to a quart of water is used for filling the jars. If two tablespoons of vinegar are used to a quart of water the time may be reduced to one and one half hours. The flavor where the smaller amount of acid is used is much less distinct and will therefore be more acceptable to some people, even though the increased time of processing required does make the vegetable slightly softer.

Bitting and Bitting in their bulletin, "The Bacteriological Examination of Canned Foods," from the Research Laboratory of the National Canners' Association, in speaking of the variation in spoilage in different sections of the country, and in the same section during different seasons, say: "This much is known, that peas are sterilized in New Jersey in a shorter period than in Wisconsin, and in the latter state in less time than in New York." In this connection it might be noted that we have found it much more difficult to sterilize culture media in the bacteriological laboratory here than in similar laboratories in Wisconsin, Illinois, and Pennsylvania. The inquiries received in regard to the canning of asparagus, as well as our own work, lead us to believe that the preservation of this vegetable, like the sterilization of culture media, is more difficult to accomplish here than in many sections of the country.

In the bacteriological examination of the canned asparagus all the jars were opened with special precautions against outside contamination. The work was done in a small culture room in which the floor and work

table were kept moistened to prevent any particles of dust from floating in the air. The jars were first washed thoroughly with water to remove any dust. The excess of water was removed with a dry cloth. The jars were then inverted in a dish containing 5 per cent carbolic acid solution and allowed to stand for ten minutes. After draining the jars were transferred to a dish containing 95 per cent alcohol and allowed to remain for ten minutes. The solution in each case came well up on the shoulder of the jar. The jars were lifted from the alcohol and drained for a few seconds, and the alcohol was burned off. The seal was broken by inserting the point of a sterile knife beneath the rubber. The lids were carefully removed and material for the bacteriological study taken with a sterile pipette. Both aerobic and anaerobic cultures were made. Two, as yet unknown, anaerobes have been isolated. The spore-forming aerobes, such as those of the *B. subtilis* group, *B. vulgatus*, and *B. megatherium*, were the types most often found associated with the spoilage of the asparagus.

Good flavor and odor in canned vegetables are not necessarily proof that the product is sterile. A number of jars, which after nine months were excellent in flavor and odor, showed the presence of organisms on culturing. These, as well as numerous other tests conducted in the bacteriological laboratory, indicate that the perfect seal had prevented the development of the organisms present. Those jars treated with vinegar showed the presence of organisms less frequently than did those not so treated. The combination of high temperature and dilute acid seems to be very effective in destroying bacterial life.

Further work on the canning of asparagus is under way in the hope of determining more definitely what methods and periods of processing are most successful. At present the following conclusions seem justified by the results of the work done up to date:

1. A period of processing necessary to sterilize the asparagus softens the vegetable to an undesirable extent.
2. Small quantities of acid added in the form of vinegar are very effective in reducing the time of processing necessary for the preservation of the vegetable.
3. The flavor imparted by the vinegar may be detected but is not objectionable.
4. Blanching is justifiable for the purpose of shrinkage before packing but not as an aid in preservation.
5. Jars that are apparently keeping may contain living organisms.

METHODS TO BE USED IN THE STUDY OF GAS CONSUMPTION OF THE ORDINARY HOUSEHOLD RANGE

Experimental Kitchen, Office of Home Economics, U. S. Department of Agriculture[1]

Rough estimates as to the amount of gas used in various cooking performances, such as baking a given weight of bread until "done" (95°C. to 100°C. in center of loaf), or boiling a given weight of potatoes a given length of time, can be made by reading an ordinary meter so connected that no other gas passes through it than that for the stove being investigated, at the time that the test is made. These estimates answer many practical purposes very well.

For more careful comparative tests, in experimental work, it is necessary to have a special dial on the dry meter, so that the quantities can be read to small fractions of a cubic foot. For precise measurement of gas volumes the wet meter is most commonly used, as it has numerous advantages over the dry meter. A detailed description of the construction of meters, and discussion of the degree of accuracy attainable in their use, may be found in Technologic Paper No. 36 of the Bureau of Standards.

In some instances readings involving small magnitudes, such as decimal fractions of a cubic foot, are of significance, and it is therefore necessary to correct the observed volumes for temperature of the gas and for barometric pressure. This is the case in computing the rate of cubic feet per hour of gas consumed by each of the top and oven burners of the stove. If we find, for instance, that top Burner No. 1, when turned on full, has today used 1.25 cubic feet of gas in five minutes (i.e., 15 cubic feet per hour), whereas last month upon one occasion it used only 1.11 cubic feet in five minutes (13.32 cubic feet per hour), we must, of course, seek some explanation of this variation of 12.5 per cent between the two readings. Now if the first reading were taken in mid-afternoon of a 100°-in-the-shade day on the first week of September, when the gas in the kitchen meter showed a temperature of 99°F. and the barometer registered 29.6 inches, in order to bring the observed volume to a standard condition of 60°F. and 30 inches pressure, it would be necessary to multiply the observed volume by a correction

[1] It is a pleasure to acknowledge our great indebtedness to Mr. W. M. Berry of the U. S. Bureau of Standards for his expert advice and generous coöperation in the matter of planning and arranging the equipment used in these studies we are now making, and also for many other valuable suggestions.

factor of 0.875. But the second reading was perhaps made on a chilly October morning, with no furnace heat started as yet; temperature 60°F., barometer again 29.6 inches; correction factor for gas volume, 0.986. Multiplying 1.25 cubic feet by 0.875, and 1.11 cubic feet by 0.986, we obtained exactly the same thing in each case, viz., 1.09 cubic feet. Since many of our calculations as to necessary outlay for gas in various cooking and baking procedures must be based upon a knowledge of the amounts of gas used by various burners when burning at full capacity, or where turned down at an angle of 30° or 45°, it is necessary to determine these rates quite accurately; and for that purpose, the correction factors for gas volume, at various temperatures and barometer readings, should be made. When these corrections have been made, duplicate readings should check within 4 per cent or 5 per cent at least, even when separated by a considerable time interval. The barometric reading can always be obtained from the Weather Bureau, if in no other way.

The temperature of the gas is usually near that of the room, but this should not be taken for granted. Wet meters usually come provided with thermometers to show both the temperature of the water and that of the gas; the two readings should be within a few degrees of each other. A table, showing the factors to be used in correcting various combinations of barometer and thermometer readings to standard conditions, is given on pages 6 and 7 of "Gas Calorimeter Tables."[2]

The meter should be preceded by a regulator[3] so that the adjustment of the appliance will not be changed by variation in the gas pressure. There should be a manometer or pressure gauge on the meter to show the pressure at which the gas is being metered, and this pressure must be added to the barometer pressure to get the total pressure of the gas.

A meter prover could be used in place of a wet meter, where not more than 5 cubic feet of gas are used in any one operation; but these are very expensive and have no particular advantage over a wet meter.

The adjustment of the stove should be such that it is capable of doing work with optimum results so far as reasonable economy in gas consumption and also in time are concerned. For example, we found that in the particular range with which we proposed to work, there was

[2] Bureau of Standards, Circular 65. Supt. of Documents, Gov. Printing Office, Price 5 cents.

[3] The following manufacturers make satisfactory meters and dry gas regulators: Reynolds Gas Regulator Co., Anderson, Indiana; Sprague Meter Company, Bridgeport, Connecticut; Equitable Meter Company, Pittsburgh, Pennsylvania; American Meter Company, 105 W. 40th Street, New York City. Oven and other thermometers of excellent quality and in a variety of forms, are supplied by Taylor Instrument Company, Rochester, New York.

a distance of 1¾ inches from top of burner to bottom of vessel when the latter was in place. Inasmuch as recent work all tends to show that, in burners of this type,—or, indeed, of most types used for top burner cooking—a distance of 1 to 1½ inches secures the best economy of gas, it was necessary to change the adjustment, making this distance 1¼ inches.

Then, again, it seems hardly wise to spend a great deal of time on gas consumption studies with top burners, where there is no provision for using more than 5000 to 7000 B. T. U. per hour,[4] because, although the greatest economies can perhaps be thus achieved, the expenditure in time required for cooking is sufficiently great so that most women who can have the quicker service will hardly feel that they can forego it for the sake of the small money saving earned by so much waiting. However, this statement is not to be understood as discouraging the use of the simmering burner or other arrangements for completing, at relatively low gas consumption, a cooking process which has already been started.

The accompanying forms are used for recording observations taken during top burner cooking and oven baking, respectively. Of course, not all of these data are always needed. In many instances, observations on gas consumption during oven baking are limited to the data recorded under numbers 1, 2, 3, 5, 6, 7, and 8, although some indication of oven temperature is really necessary in order to show, for instance, why it takes as much gas to bake one pie as to bake three loaves of bread, though the latter bake longer.

It is well understood that there is a great deal of variation in individual samples of most food materials, their condition as to water and fat content, the size and surface of pieces which they present when ready for cooking, and in other ways. Furthermore it is often difficult to select a sharp end-point representing any particular degree of doneness of most foods. Consequently comparative studies of efficiency of equipment are made, whenever possible, on the process of heating water alone. The problem will then be to determine the effect of any given

[4] For the benefit of those not accustomed to thinking in terms of British Thermal Units per hour, it might be added that (so far as our information goes) most cities using artificial gas have standards requiring somewhere in the neighborhood of 550 to 600 B. T. U. per cubic foot of gas supplied. Natural gas, on the other hand, usually runs higher, often about 1000 B. T. U. per cubic foot. This fact makes a comparison between the work of different laboratories impossible, on the basis of *cubic feet of gas used*. It explains the criticism of certain studies in gas consumption (made with artificial gas) published several years ago in the *Journal of Home Economics*, when we observe that these protests came from users of natural gas. The readings in cubic feet should, of course, be reduced ultimately to B. T. U.

arrangement upon the length of time required to bring a given weight of water from some stated initial temperature (e.g., 60°F.) to the boiling point. It will readily be noted by any observer of gas consumption with different equipments that, so far as the ordinary (covered) top-burner cooking utensils are concerned, the most important single factor in securing gas economy by household management is the *relative diameters of burner and base of utensil*, providing distance between burner and vessel has been properly adjusted. If the bottom of the utensil does not project some little distance beyond the edge of the flame on all sides, there will be an unnecessary loss of heat (hot air and products of combustion) streaming up, though invisibly, all about the kettle. We realized this fact very keenly when working with one of the so-called "gas-savers" sold in hardware stores. It does not save gas; in fact it often has the contrary effect,—for, though the burner uses the same amount of gas per hour with and without the "saver," yet the latter wrongly directs the flame, so that, when heating water in a dishpan or large tea kettle, about 25 per cent increase in time is required to bring the same amount of water to the boiling point, with the "saver" in place. When, however, an ordinary saucepan, measuring six inches across the bottom and holding 2 quarts of water, was used in these comparative tests, the efficiency was so low and the loss of heat about the sides of the vessel so great that the misdirection of the flame by the "saver" could affect no further waste. The cause of this low degree of efficiency is, of course, found in the limitations imposed upon the rate of absorption of heat by the water, due to the limited conductivity of the vessel and the small amount of surface exposed to the flame.

The *per cent of efficiency* of any given set of conditions is the final test of gas economy. In the case of water-heating, it may be determined by dividing the number of B. T. U. actually absorbed by the water (product of weight in pounds by temperature-interval in degrees F.) by the number of B. T. U. actually used, as indicated by the meter and the value in B. T. U. per cubic foot of the gas used. These percentages vary widely even in the best of our ordinary household practices: from 20 to 40 per cent would represent a good proportion of them, in case of top-burner cooking,—though the efficiency sometimes reaches 50 per cent. These facts are the basis of the statement, occasionally made, that the ordinary kitchen range as it is usually managed, wastes five-sixths of the heat supplied to it. A study of the many devices suggested for conserving gas with the kitchen range, offers a very wide and fruitful field.

FORM OF RECORD FOR STUDY OF GAS CONSUMPTION, TOP BURNER COOKING

1. Date. 2. Hour of day. 3. Barometric pressure. 4. Temperature of gas.
5. Pressure of gas. 6. Number designating burner used.
7. Description of pan or vessel used: material of which it is made; character of surface, black or bright, rough or smooth; weight, or thickness of walls; general shape; diameter at bottom, at top; excess of diameter at bottom over diameter of burner used; depth, capacity of vessel.
8. Cover used: material, weight, diameter.
9. Amount of water to be heated. Temperature of water at beginning of heating period.
10. Amount of other material to be heated, if any. Careful description or specification of such material, of amount of surface exposed. Temperature when put in to cook.
11. Distance of bottom of utensil from top of gas ports.
12. Final temperature of water; of cooked material, if any (take temperature in center of mass).
13. Time of cooking. 14. Cubic feet of gas used. 15. B. T. U. used.

FORM OF RECORD FOR STUDY OF GAS CONSUMPTION, OVEN BAKING

1. Date. 2. Hour of day. 3. Pressure of gas. 4. Barometric pressure.
5. Number designating oven used. (Description of oven should be somewhere recorded: dimensions; material of which walls are made; thickness of walls and floor; number, form, and size of burners; number of gas ports each contains; method of circulation of products of combustion—whether into or around oven. Measurements of relative humidity inside the oven would certainly be very desirable, if some one can develop a practicable method for taking them).
6. Material baked. Description of: composition, weight, number of units (rolls, loaves, etc.).
7. Preliminary period of oven heating: time, cubic feet of gas, B. T. U. used.
8. Period of baking: time, cubic feet of gas, and B. T. U. used.
9. Temperature of oven at 5 minute intervals. The graphic form of record is the best; i.e., plot curve having time intervals as ordinates and temperature readings as abscissae.
10. Weight of food material after baked. (Percentage loss in weight due to baking).
11. Temperature in center of mass of food material, immediately on taking it from the oven. (Better still, a curve showing the temperature changes, during baking, in the center of the mass of food material. Such a record can be obtained by the use of thermocouple with potention etc).
12. Comments, or score showing quality of product as determined by baking.
13. Cost of gas per pound or per serving of baked food.

A STUDY OF THE PRESENT COST OF FOOD

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During this period of rising prices, old budget percentages are not of much help to the home maker, struggling to keep her family well and happy on a limited income. Instructors in household management have likewise had readjustments to make while those in charge of practice houses are still feeling their way. In these establishments the question is not only what standard of living should be maintained, but, at present, upon what sum the students should be expected to maintain it.

In "ante-bellum" days the house management students at the University of Wisconsin Practice Cottage were given a maximum of thirty-five cents a day a person for raw food material—the equivalent of $12.25 a week for a family of five adults. With this sum, the girls not only managed successfully, but found there was still sufficient money in the purse to enable them to entertain two guests each week at a semi-formal dinner and four guests at luncheon. This year the amount to be spent for food has necessarily been increased. With all prices soaring it was impossible in September to set a maximum allowance; so each group, realizing that a crown of laurel was due the one which succeeded in keeping its members well fed at the least cost, strove to see what the standard must be.

Since the work in household management follows the course in dietetics given in the junior year, the students' ability to plan menus is presupposed, and emphasis is placed upon the wise expenditure of energy and money, as well as upon the balanced ration. The food served has always been simple. Breakfast usually consists of fruit, cereal or hot bread, and a beverage. Eggs appear at least once during the week, and other mornings the protein is supplied by the whole milk on the cereal and the eggs in the muffins. For variation, the fruit is frequently omitted and marmalade takes its place. At luncheon, the protein may be served in a "meat substitute" dish of cheese, lentils, eggs, or occasionally fish, or in a cream soup. With the addition of a hot bread and a salad the meal is complete. A simple dessert often takes the place of the latter. Tea or cocoa appears when soup is not on the menu. For the evening meal there is meat, or a substitute for it, a starchy vegetable or cereal, two succulent vegetables—one of which may be served in

salad form if the luncheon had no salad—and a simple dessert. On "guest night" the dinner begins more formally with soup and ends with café noir.

In order that the work of the different groups may be fairly compared, the students present a full report at the end of their week at the cottage. One phase of this report gives the percentage of the total expenditure spent on various items of the food budget. This material has been organized into the following table and shows what has been possible this year in relation to the tendency during more normal times.

Percentages of Total Expenditure

KIND OF FOOD	NOV. 1914	OCTOBER–DECEMBER, 1918						
		Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Group 7
	per cent	per cent	per cent	per cent	per cent	per cent	per cent	per cent
Beverages	1.8	1.6	0.15	2.07	3.0	2.3	2.5	0.9
Bread, cookies, and wafers	2.7	4.7	3.7	5.0	2.1	3.5	2.4	3.6
Butter and butter substitutes	9.6	5.3	8.1	3.36	8.2	5.9	5.5	8.0
Cheese	1.5	2.9	1.7	1.8	0.9	—	2.1	2.7
Cream	5.6	1.4	4.0	2.4	4.6	2.8	3.1	7.05
Eggs	6.8	3.7	4.8	6.03	2.8	9.7	4.0	3.6
Flour and cereals	3.9	6.4	8.6	1.3	1.7	7.2	4.4	5.09
Fruit, canned and dried	5.9	3.5	4.9	4.8	4.2	2.7	4.3	6.6
Fruit, fresh	9.09	10.9	8.7	7.9	5.4	5.9	12.0	6.5
Lard and substitutes	1.5	2.2	2.2	1.2	—	2.8	0.9	1.7
Meat and fish	22.2	21.4	19.0	24.0	17.41	16.6	23.9	19.1
Milk	4.9	6.05	6.4	7.0	10.6	8.0	7.6	6.2
Miscellaneous	6.2	13.38	9.6	12.29	11.77	11.1	7.5	1.2
Oils	1.2	1.34	3.8	2.0	—	0.25	1.0	0.05
Sugar	3.4	0.44	0.95	0.97	2.55	2.07	1.7	3.4
Vegetables, canned and dried	3.5	—	3.6	6.6	9.59	8.4	4.5	11.5
Vegetables, fresh	9.06	13.76	12.3	10.5	11.47	7.8	12.5	11.7
Total cost per week (dollars)	12.25	16.40	14.49	15.645	14.525	15.54	16.275	16.45

As is to be expected, the per cents in many cases are higher for 1918 than those for 1914. In the case of meat and butter, the reverse is true in spite of the steady rise in price of these commodities. This is due largely to the increased use of substitutes for both items. The lower per cent for butter is also due to a continued observance of the "breadless meal" at the cottage. Since bread at dinner is really a case of "coals to Newcastle" and since conservation measures have taught us to do very well without it, the girls think that continuing the habit is an easy way of cutting expense. The percentages in general vary with the individual tastes of a group, but in some cases the variance is due to a

lack of ability to cope with the situation. Those groups spending the most seem to have done so because of lack of wisdom in buying. Groups 1 and 6, for instance, paid more for meat and fresh fruit than was necessary for the good of the family. Group 7 was extravagant in its use of cream as well in paying seventy-six cents a pound for butter. The proportion spent for butter by the girls in Group 2 was even greater, but they were so economical along other lines that their total expenditure was below average. Thus the work of each group may be analyzed. However, many of the differences are what one would expect to find in comparing a number of food budgets.

The following tables, also organized from the weekly reports, show the total results of each group's experiment.

Cost of Raw Food

DATE	NUMBER OF PLATES SERVED			COST OF RAW FOOD PER 5 DAYS	COST PER PERSON PER DAY	COST FOR FAMILY OF 5 PER WEEK*
	Regular family	Guests	Total			
October 21	75	9	84	$13.236	$.471	$16.40
October 28	75	7	82	11.372	.414	14.49
November 4	75	6	81	12.1219	.447	15.645
November 11	69	10	79	11.0147	.417	14.525
November 18	75	10	85	12.609	.444	15.54
November 23	75	10	85	13.221	.465	16.275
December 2	75	6	81	12.756	.47	16.45
January 6	77	2	79	12.285	.477	16.695
Average				12.32	.45	15.75

Cost of Prepared Food

DATE	COST OF FUEL USED IN FOOD PREPARATION		ICE	COST OF PREPARED FOOD PER 5 DAYS	COST PER PERSON PER DAY	COST FOR FAMILY OF 5 PER WEEK*
	Gas	Electricity				
October 21	$.66	$.15	$.15	$14.196	$.507	$17.745
October 28	.907	—	.075	12.354	.45	15.75
November 4	.925	.017	.40	13.467	.498	17.43
November 11	.462	.079	.375	11.93	.453	15.855
November 18	.59	—	.15	13.349	.471	16.485
November 23	.66	.118	.15	14.149	.499	17.465
December 2	.682	.118	—	13.56	.50	17.50
January 6	.65	.10	—	13.0358	.507	17.745
Average				13.25	.48	17 00

*Estimated, since girls remain at cottage but 5 days.

Some groups have been much more successful than others, but, from the figures obtained from their united efforts, it appears that 45 cents per day per person—or about $15.75 per week for a family of five women, all of whom are grown— is more nearly the amount needed under present conditions for raw food material.

It is hoped that this study, which is offered merely as a basis of comparison for those having similar work under their direction will result in reports of the work being done in other practice houses.

COÖPERATIVE RESEARCH IN EXPERIMENTAL COOKERY

At the recent meeting of the American Home Economics Association several members of the Science Section interested in experimental cookery met with Miss Denton, representing the Office of Home Economics, and Miss Blunt, Chairman of the Science Section, to discuss the possibility of coöperative research in this work. This is a development of previous plans made both by the Science Section and by the Office of Home Economics. Dr. Langworthy, of the Office of Home Economics; Miss White, President of the American Home Economics Association; and Miss Harris, Chairman of the Home Economics Section of the American Association of Agricultural Colleges and Experiment Stations, have been consulted, and the present project will be undertaken with the coöperation of these organizations. It is obvious that we need coöperation for at least two purposes:

(1) We need to work out standard methods of procedure. Ask those who have worked on the subject what they think of Master's report, in the *Biochemical Journal*, that soaking legumes over-night does not decrease the time required for cooking to any considerable extent. One worker remarks: "If she had used tap water she would have found that soaking decreased the time of cooking very greatly." Another observes "With as hard a water as we have soaking increases the time of cooking instead of decreasing." Equally contradictory results have been reported in many other problems. It is evident that results are contradictory only because not all of the variants involved have been recognized. Workers in agriculture, in food chemistry, in bacteriology, and in other kinds of practical research have developed standard methods. It is time for us to do it.

(2) We need to exchange experimental results. Only those who have talked with workers representing widely scattered institutions can realize how much good material is locked away in the records of home economics workers all over the country. A piece of work possibly only partially finished by one investigator might be dove-tailed into that of others, so that a really big product would result from the combination.

Are the members of the Association in favor of such coöperation? Will you subscribe to the following plan?

(1) To choose a few lines of work for emphasis before the June meeting of the American Home Economics Association. The lines suggested are listed in paragraph 3 below.

(2) To ask everyone who has done work on these subjects to send a full report before May 28 to the Chairman of the Science Section of the American Home Economics Association who will, in turn, send the reports to a sub-chairman for each subject. The Chairman and the various sub-chairmen, of course, agree to make no use of the results without the consent of the person submitting them.

(3) In order to assist in the making of these reports by the different investigators, to have suggestive outlines formulated by some one or more workers from those they themselves use, and to have them sent to all interested in the same line of work. Of these outlines Miss Denton of the Experimental Kitchen in the Office of Home Economics has prepared those on "Cooking of Dried Vegetables and Fruits," "Jelly-making," "Records of Gas Consumption in Top Burner Cooking," "Records of Gas Consumption in Oven Cooking;" Miss Elizabeth Miller of Iowa State College has prepared that on "Cooking of Fresh Vegetables;" Miss Denton and Miss Miller are coöperating in the making of outlines for "Record of Operations in Cake Making," and "Record of Operations in Pastry Making;" and Miss Blunt and Miss Denton are coöperating in the outline on "Fat Absorption and Changes in Fat in Frying." One of Miss Denton's articles appeared in the March JOURNAL, and a second is in this number.

(4) To bring together the various reports for discussion at the June meeting so that new points for investigation may be brought out and the possibility of joint publication considered.

If you approve of this plan, please send to the Chairman of the Science Section for such outlines as you desire, and also send your own report to her. This letter is being sent to all those who have recently reported to Dr. Langworthy.

AGRICULTURE OF THE HIDATSA INDIANS—AN INDIAN INTERPRETATION[1]

The author collected his information during the summers of 1912–1915, at Fort Berthold reservation, from a Hidatsa woman, born about 1839, who prepared the food for her family, as well as tilled the soil. Much of this volume is devoted to characteristic dishes evolved from the agricultural products.

Corn, beans, squashes, and sunflower seeds played an important part inthe diet of the early Hidatsa Indians. The sunflower seeds were parched and pounded into a meal which was cooked with parched corn meal, dried squash, and beans, and constituted an important winter dish which they designated as "four-vegetables, mixed." Sunflower-seed meal, because, of its high oil content, could be squeezed into balls. These balls were wrapped in pieces of buffalo heart skin and were used by the Indian warrior in much the same way as sweet chocolate is used by the modern soldier. Small fresh squashes were boiled whole with a small amount of water in earthen pots covered with sunflower leaves. The seeds were also eaten, and taste, according to the narrator (Buffalobird woman), much the same as peanuts. Quantities of squash, and some of the squash blossoms, were eaten or dried for winter use. The squashes were sliced and the squash rings threaded on willow spits and hung in the air to dry. After three days these were removed from the willow spits, strung on dried grass, and hung in the lodge until ready for storing. When using the dried squash the Indian woman cut a piece of the string as long as from her elbow to the tip of her thumb, tied the string together, and dropped the ring of squash into boiling water. When done it was lifted out by the string, mashed with a horn spoon, and the string removed.

Of the several varieties of beans used, the narrator prefers the black bean, although of late years she says she has grown mostly white beans, since it is easier to sell them to the white men. The beans were cooked, in earlier times, with buffalo meat or bone grease and in combination with other foods. The Hidatsa cultivated nine distinct varieties of corn, all of them used as food. Even the black masses of corn smut were eaten after drying and cooking with the half boiled dried corn. The fresh green corn was boiled or roasted on the cob or shelled, pounded in a mortar, and boiled with beans or made into so-called green corn bread by baking the corn pulp in corn husks. The corn was dried by boiling on the cob and allowing the cobs to dry overnight and then shelling, and the drying continued. The ripe corn was made into hominy or was parched and ground into a meal. This meal was boiled with water to form boiled corn balls or it was cooked with beans or dried squash.

The seasoning used in many of the native Hidatsa dishes was obtained by burning corn cobs and collecting the crust that formed on top of the ashes.

[1] G. L. Wilson, Bul. Univ. Minn. No. 9 (1917), pp. viii + 129, pls. 5, figs. 40.

FOR THE HOMEMAKER

THE HOUSE SPEAKS[1]

ARTHUR D. DEAN

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I am glad that I am here with you all. It is good to hold within myself those who can fill me with joy, contentment, and purpose. I am grateful for the expressions of clear thinking, clean doing and child love of those about me. I am joyous that the voice of youth passes my doors mellowing me in my old age and recalling the days when I was built by youth. I am pleased with my natural setting of trees, the odor of sweet grasses and the bloom of flowering shrubs. I am fond of listening to words of endearment, of watching little marks of affection, of interpreting signs of understanding between that big fellow John and his mate, bright-eyed Vida, and little John junior.

I am always watching the people in this house—those who come and go, those who seem to come and never really go, those who go without really ever coming, and those—three—good people who always stay.

Everyone speaks of me. Some say I am cute—odd—different. Some say I am pretty—attractive—homey. But those three about me just say "Home."

But I insist that I am more than odd, attractive, or pretty. I am a message—a message of sincerity, simplicity, service.

I am a prototype of the habitations of Colonial New England. My ancestry held sturdy, serviceable, sincere people. Today I again hold such people. My very bones are hewed from logs; my heart is a huge fireplace of warmth, of crackling forces, of brilliant coloring; my hands reach through the doors and welcome the passing stranger to a share at our simple board.

[1] Reprint of the booklet by the same name.

The author's note on his booklet is "The prototype of a New England home of Colonial days built in that north country of the upper peninsula of Michigan spoke from out of its heart to me one soft summer evening in July, 1913."

How hard my ancestry struggled to hold its people to the manner born—of integrity, of purpose, of simplicity. But we were called cold, puritanical, set in our ways. We were made over, modernized, brought up to date. My roof—I should say my head—was filled with a lot of stickouts until I leaked the waters of the heavens. I was plastered over with side additions until I was scattered over the ground. My heart was removed and in its place there appeared a gas log. My ribs became little sticks and it seemed that I would break under the load. They filled me with gaudy stuff and flaunted the cost tag before my eyes. They filled my corners with gim-cracks. They closed my eyes with lace curtains. They covered my feet with strange and fearful weavings. They tied my hospitable hands with formalities and receptions.

I lost my identity completely. They crowded me with other disappointed ancestors and called me an apartment. People still came. They still went. But no one stayed. The theatre was their round table. The street corner was their door step. The vaudeville was their prayer. I became a bedroom and a bath. I was to be used when everything else in town was shut up. Oh! the ignominy of it all.

But now I am again in the world of living things. A thousand miles from my birthplace I again softly whisper my message in this north country where city throngs are yet to come and where I can whisper—simplicity, sincerity, purpose.

I want these people who speak of me as home to know how much they fill me with their strong life purpose—their humanness and their understanding. When they built me they built what they were themselves—simple, strong, straight. They, like me, are open, clean, straight lined.

We shall grow old graciously. I shall shed the rain and avoid decay. They will throw off discontent and not harden with the passing of youth. I shall take on the rich color of age. They will gather the soft tones of repose in their faces yet to age.

Together we bring up the youth in this place—the older two by words and deeds; I by silent example. I will let the soft air of summer sweep across the rooms of childhood. I will guard the boy from the winter's chill. I will hold up my straight lines that he may see the straight way. I will show him my simplicity that he may learn sincerity. I will lay before him my simple decorative effects that he may feel the importance of a touch of the esthetic on a back-ground of solidarity. I will stand firm on my foundations that he may know the value of

integrity. I will line my walls with books that he may know of the world of thought and action. I will have space for instruments of music that he may be spiritually strengthened in the world of endeavor. I will withhold from extravagance that he may learn the value of the necessary and the simple.

I live for those two who built me. I live for the child whom together we are shaping into high ideals of service rendering—rendered with joy, simplicity, and purpose. I am glad that I am here. May they who hold me with papers legal know that I hold them as their Home.

THE HOME AND THRIFT

The school may do much to teach thrift among the young, but it cannot do as much as the home. In this the nursery of the nation, the fundamental things of life are instilled into the mind of the child. In proportion as this is done well, or badly, will the next generation make valuable citizens.

The people of France, Belgium, and Holland are famous for their thrift. How did they become so? Through the influence of the home. Necessity, combined with good sense, years ago taught the fathers and mothers in these countries to be thrifty, and the lessons of thrift have been faithfully handed down from one generation to another.

The rising generation will be thrifty if thrift is taught and practiced in the homes of this country. The school may do much to promote saving, but it cannot do nearly as much as the home, since the former only has the child for a few hours a day.

Department of Information, Ottawa.

"Waste has no right to exist anywhere under any circumstances."

BUDGET MAKING

S. AGNES DONHAM

The Garland School of Homemaking, Boston

Early in her experience with teaching the distribution of the family income, the writer became aware of the fact that the "ideal percentages" could be ideal only within certain very restricted limits. An income above five thousand dollars offered wider possibilities in savings and higher life; operating easily outran its percentage limits, though its component parts still seemed legitimate, even wise, expenditures. Food, too, dropped below its limit, and the cost of shelter was frequently much below or far beyond the amount of the ideal, according to circumstances of environment or standards.

When the income was below three thousand dollars, the cost of food enough to nourish the family at once exceeded the ideal and again the percentages served only as a point from which to depart.

Added to these difficulties was the fact that the untrained budget maker is afraid of percentages. They appear like a ferocious beast ready to devour all attempts at planned distribution of the income. However, it was not until war time, with its attendant changes in the cost of living necessities, that the following method of teaching the budget was evolved.

It has been successful with girls whose kind had stumbled along with percentage divisions very unhappily, and it has frequently proved helpful to housewives who would have fled from the old methods in dismay.

Starting with the enumeration of all known expenditures for a family of four or five, these are grouped under the five heads made familiar by Mrs. Richards. The writer earnestly pleads for the retention of these, and believes that the whole subject of income distribution would be simplified if every teacher and housewife would adopt the same general headings and fit subdivisions to their individual needs. It is only by such a course that the actual experiences of budget makers will ever be available for comparison with others, and profitable for study.

Taking then the five general headings—Food, shelter, clothing, operating, and higher life—the class discusses first the arrangement of all expenditures under these divisions.

Food: All bills for food and ice, whether consumed at home or at work, or in a public eating place.

Shelter: Rent and business carfare, or interest on investment, taxes, house repairs, business carfare, and fire insurance.

Clothing: All clothing, new materials, sewing materials, making, repairs, and cleaning.

Operating: Heat, light, water, service, laundry, household supplies, telephone, inside repairs, replacement and repair of equipment, stationery, postage and express, small miscellaneous house expenses, newspaper, incidental carfare, etc.

Higher Life: Health—doctor, dentist, oculist, optician, nurse, medicine, and supplies. *Church dues. Culture*—theatre, concerts and lectures, books and magazines, travel. *Education*—schools, public or private, special lessons, text books. *New equipment. Philanthropy. Savings. Social life*—~~club dues~~, recreation, entertaining, gifts.

The fact is brought out that food, shelter, and clothing are the essentials; that most expenses for operating, outside of heat, light, and water, are only possible when there is a margin; that money spent for higher life is also spent from the margin; that expenditures for the three essentials increase with an increase in the amount of the margin; and that in each division there are expenditures which might as properly be placed in the last—higher life, or region of choice—were it not that it is useless to divide expenditures into absolute essentials and margin, for one is at once confronted with the knowledge that essentials for one family are luxuries for another. Arbitrary division must be made and it has over and over proved desirable to make it upon the basis of natural division rather than to split hairs and try to determine what portion of the amount paid for rent is essential for shelter, and what portion is spent to gratify a desire for comfort or enjoyment. When the amount spent overruns its apportionment, however, these facts must be considered in making a decision as to whether the expenditure is justifiable.

Having the distribution of expenditures well in mind and some knowledge of the actual costs which must be met from a comfortable income, the class is ready for the analysis.

Study of actual incomes of which some of the details of expenditure are known proves far more impressive and effective than the analysis of arbitrary amounts with no actual data except a general idea of costs in a typical community. It is here that the plan for division without the use of percentages is developed.

Psychology is a positive factor in any method of procedure, and for some reason the ordinary human being finds it easier to save if he plans expenditures without reference to saving. To meet this quirk in reasoning, the savings are treated as a separate sum, and the remainder of the income divided as if it were the whole. The plan necessitates a decision as to the amount the family may expect to save, and then the division of the remainder into five equal parts, each of which represents the apportionment for one of our headings.

To illustrate this graphically, draw a circle, write above the circle the amount to be saved, divide the circle into five equal parts, name each part, and write in it the amount of its apportionment. (See figure 1.) Each class of expenditures is considered worthy of its share of the full income, and at the beginning of the discussion the groups are treated as of equal importance.

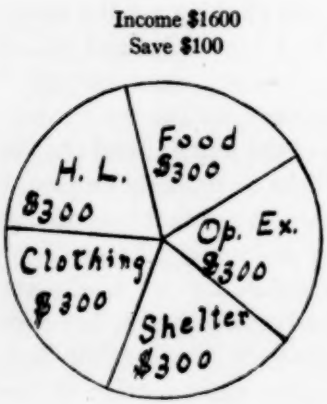

Fig. 1

Fig. 2

The fact is readily brought out that from an "existence income" food will be purchased before any thing else, that shelter will be the second consideration, that clothing enough to cover the law costs little, that heat and water are the operating expenses first incurred, and that with a very small income there is little or no margin beyond what is required for these essentials.

The expenditures for food are the first consideration. With a small income where food demands nearly all of the money, the figures furnished by the Boston Dietetic Bureau are used as a basis of reckoning. The minimum amount required according to the ages and work of the

members of the especial family under consideration is taken as a starting point. In several cases it has been possible to fix $10 a week for the round figure necessary to purchase adequate food for the families under discussion. It is at once evident that the $1500 family must use from its margin to provide food enough to nourish, and this is done usually by deciding that one hundred dollars must be taken from operating expense and one hundred from higher life.

Discussion sometimes leads to a division of opinion as to the source of the other $20, some preferring to reduce the rent, others claiming that in most communities $300 is the least amount for which safe shelter can be obtained. It usually ends in taking from shelter if it can be shown that the family has at present safe shelter at lower cost than its apportionment allows, otherwise taking from higher life, and the circle is again changed to correspond to the new apportionment. (See figure 2.) With a very small income the space for higher life is soon nearly taken up by the new apportionments, the space for operating is cut to the amount necessary for heat, light, and water; and the apportionment for clothing is greatly reduced, sometimes disappearing altogether if clothing is given to the family.

If, as frequently happens, the amount necessary for *adequate* food, *safe* shelter, *essential* operating, and *necessary* clothing has used all the circle, it is evident that too much has been set aside for savings, and a new chart is made, starting with smaller savings.

The questions which puzzle the beginner, without definite knowledge of former expenditures, are in regard to the amounts necessary for operating, higher life, food, and clothing. Lists of questions in regard to cost of fuel, light, water, rents, taxes, insurance, telephone service, interest, income tax, service, are given to the class and information is obtained from friends and any source possible. In some cases visits to real estate agents have solved disputed questions as to rents to be paid.

When all the information possible has been gathered together the probable expenditures in each group are subdivided under three heads: fixed charges, charges possible to estimate, and charges necessary to limit; for example, in the shelter group, rent is a fixed charge, business carfare may be a fixed charge, taxes are possible to estimate, interest is a fixed charge, outside repairs are necessary to limit.

With $300 a year to spend for shelter, rent at $20 a month will equal $240, and business carfare will be estimated at $50, giving a total of $290.

If the house is owned, interest at 5 per cent on $2000 will be $100 and will be a fixed charge; taxes may be estimated at $60; and carfare at $50, which would leave $90 for repairs, a charge necessary to limit. In the same way it is possible to build a foundation for each group of expenditures. When the fixed charges and estimates equal the apportionment the other possible expenses will necessarily be omitted or must come from another apportionment; but when, as in the case of higher life, most of the expenditures fall under the head of charge necessary to limit, it becomes a game in choice of values.

Students frequently ask what is to be done in case of an illness which consumes more than the limit set. The answer is obvious, one must either use savings or reduce expenditures for the less essential factors in that group. The same thing exists throughout the budget. If one departs from the original plan it should be because increase in income makes it possible, or by making a conscious change, relinquishing some planned expenditure entirely or reducing the quality or quantity purchased. Such changes should always be made within the group, if possible.

The advantages of this plan and its graphic illustration are, first of all, that each group of expenditures is given due regard; second, that no group can entirely disappear without consciousness; third, that it has features which satisfy the psychological attitude of many people who are afraid of percentages; fourth, that it shows very plainly when a family is trying to save more than the size of the income warrants. It is especially useful in showing faults in budgeting which the beginner often cannot recognize by the percentage method.

With sufficient food and safe shelter always considered first, and suitable clothing and essential operating next, higher life is still not ignored if there is any margin at all.

One most important result is the formation of conscious standards for each group of expenditures. These should result from the making and use of any good budget; but it is a favorite theory of the writer that no good budget is ever worked out until the maker has first formulated his standards and, by comparison, eliminated those which are unworthy and substituted better—or, in other words, measured standards by each other and fitted them to the income so that one group is not unduly considered at the expense of another.

SOME PRE-WAR PRICES, 1860

AND THEIR INCREASE

Many comparisons have been made between the cost of living at this time and shortly after the Civil War. It is worth while, when we are discontented, to remind ourselves again of the change in prices that took place at that time.

The following record illustrates the low prices that prevailed before the war:

FROM AN OLD ACCOUNT BOOK (1860)

February

½ gal. molasses	$.25
pk. potatoes	.25
4 lbs. butter	1.12
50 lb. cornmeal	1.25
10¾ lbs. shoulder	1.08
½ lb. tea	.31
quart oil	.31

March

½ gal. molasses	.31
5 lb. beef	.70
11 lbs. sugar	1.00

April

bbl. flour	7.25
3 doz. eggs	.45
2 lbs. coffee	.40
½ gal. molasses	.28

May

50 lbs. of meal	1.12
2 lbs. butter	.50

After the war, flour went as high as $22.00 a barrel in 1865. Sugar sold at 3 pounds for $1.00. Butter rose from 20 or 25 cents a pound to 75 cents. Cereals, vegetables, teas, and coffee doubled in price, and pork that sold at wholesale for $20.00 a barrel went to $60.00. In 1864 coal was $19.00 a ton and kerosene 90 cents a gallon. Spool cotton was 30 cents a spool, unbleached sheeting 40 inches wide was 60 cents a yard, muslins that were 6¼ to 12½ cents rose to 75 cents, and some of them were withdrawn from the market at that price.

MINERAL MATTER IN THE DIET

DORA L. EARL

The time is here for me to save
  The juice from off the greens,
For herein lies the best there is
  In spinach and string beans.

Without the mineral in my food
  I could not life retain;
And so I'll save the part of it
  That oft goes down the drain.

I'll eat the beet and turnip tops,
  The dock and dandelion,
And all the fruits and vegetables
  That I can get my eye on.

Then, too, I'll have both milk and eggs
  For they are rich and rare;
And then to save the mineral,
  My potatoes I'll *not* pare.

But all the breads and breakfast foods
  I must not here omit;
For when from unhulled grains they're made
  They've mineral quite a bit.

The all important point is this:
  I must have mineral matter,
And I'll eat anything that has it,
  From purslane to hard water.

EDITORIAL

Standardizing Research Work in Home Economics. The Science Section of the American Home Economics Association deserves much praise for forwarding the scheme already undertaken by the Office of Home Economics in standardizing methods of procedure for research work in experimental cookery. Many have felt for a long time that much good work is failing of part of its purpose because it has not been brought together, interpreted, checked up, and translated into terms that make it usable for practical purposes. The experimental kitchen of the Office of Home Economics, as is indicated by the records already published in the JOURNAL, is doing much to further such research, but it can accomplish still more in coöperation with the Science Section, and with the many workers and departments that for a long time have been working on problems, obtaining results to their own satisfaction, but with no definite means of communicating them to others. It is surprising frequently to find that some problem, definitely and satisfactorily solved in one institution, has been taken up as new work at another, without any knowledge of the fact that experimental work has already been carried on.

The JOURNAL particularly welcomes this move. It has often been difficult to obtain papers with the work sufficiently authenticated. Occasionally work has been published that might well have been repeated and checked by further work before it was brought to the attention of our readers. This movement will give an opportunity for better formulation of results and for more legitimate conclusions. We wish it all success.

Home Economics Contributions to the Fifth Liberty Loan. All home economics departments in public schools and in higher institutions are invited to make a contribution to the Ellen H. Richards Memorial Fund of the American Home Economics Association, in the form of a subscription to the Fifth Liberty Loan. The Richards Fund has received similar contributions during each Liberty Loan Campaign, and several institutions have already planned to raise a subscription for the Victory

Loan and contribute it to the Richards Fund. Any sum may be sent in, and it will be used towards buying bonds to be added to this Fund.

The Richards Fund of the Association now amounts to over $5000 and its income will be used the next college year to support home economics scholarships in Chicago University and in Teachers College, Columbia University.

Victory Loan Contributions should be sent to the American Home Economics Association, 1211 Cathedral Street, Baltimore, Md.

COMMENT AND DISCUSSION

AN EXTRACT FROM A LETTER

You would be surprised if you knew how much time and trouble and work I have spent in endeavoring to find some one magazine devoted to "What American Women are doing for American Women and Children." However, I am quite happy since your letter came, with the two copies of the JOURNAL OF HOME ECONOMICS. All in this household have appreciated the contents of the JOURNAL and will subscribe.

During all my travels and peeps into homes from Panama to Patagonia, I have realized that home economics is a study and practice that can bring health and happiness into many homes and countries south of us. When I was invited to speak to a College Alumnae Association, I chose as my subject Some Educational Needs of Girls in South America. That body of women is considering giving a scholarship for a South American girl to be educated in our country and for one girl from the United States to have an exchange scholarship and go to South America. They have languages, art, and culture—we have training and education. They, too, are appreciative of the freedom and joyousness of the woman of Young America.

BOOKS AND LITERATURE

Any book or periodical mentioned in this department may be obtained through the JOURNAL OF HOME ECONOMICS if the Journal price is listed.

Marketing and Housework Manual. S. AGNES DONHAM. Boston: Little, Brown & Co., 1917, pp. 235. $1.50. By mail of the Journal, $1.60.

The Home and Its Management. MABEL HYDE KITTREDGE. New York: The Century Co., 1917, pp. 385. $1.50. By mail of the Journal, $1.62.

The young teacher who has been asking "How shall I teach household management?" is finding help in two texts that offer a key to the solution of some of the perplexing problems of the housekeeper. "Marketing and House Work Manual" comes from the hands of an experienced teacher and represents a carefully developed scheme of instruction presented in concise statements and easily interpreted charts. The extensive marketing charts dealing with choice of meats, fish, vegetables, fruits, and groceries are a real contribution to the student and young housewife, for they give illuminating suggestions as to choice, care, and use of foods. The housekeeper who has become familiar with these facts through long experience seldom realizes how extensive this unexplored field seems to the uninitiated and how much simple guidance of this sort is needed. The author has for the most part been successful in her effort to keep "to the short, exact statement that there need be no superfluous words to bewilder the inexperienced and irritate the hurried," but brevity of statement has resulted in awkard construction in one or two places.

"The Home and Its Management" covers much the same field in its first two hundred pages. The book was prepared for those who live in modest homes with a full understanding of their circumstances and problems. An attempt has been made to adapt the information given to rural as well as urban conditions. In the latter half of the book there are chapters on the care of children, food for infants, and home care of the sick. Directions given are so simple that the big sister can follow them in the work that often falls upon her in the home. The truth of a few statements may be questioned and the earnest teacher who has endeavored to convince her students that an understanding of principles, a knowledge of the effects of heat on foods, and accuracy in measurement will help her in securing skill in cooking, will resent the statement that "the only way to learn how to cook is by cooking day by day, making mistakes, producing unexpectedly good results, blundering along, working, working, working, until finally you instinctively know the taste of the pudding before you begin to combine the ingredients." However, the very definite rules for cooking given convince the reader that Miss Kittredge knows the value of fundamental principles and can present them in a convincing way.

CARRIE LYFORD,
U. S. Bureau of Education.

The Study of Fabrics. By ANNABELL TURNER. New York: D. Appleton & Co., 1918, pp. 206. $1.75. By mail of the Journal, $1.85.

Since women are largely responsible for the expenditure of the family income, it is most important that they should be trained to meet the responsibility in the most efficient way. This, of course, means they must be trained to spend wisely, to know

when they are receiving the value of the money expended. "Study of Fabrics" will be found to be of considerable value in training along this line.

A discussion is first given of the production of the raw materials and the manufacturing processes of each of the common textile fibers—cotton, linen, wool, and silk. This discussion is not detailed enough to give a broad definite knowledge such as a college student of textiles and clothing would need, but would meet the needs of the average homemaker.

The portion of the book that is of most value is that devoted to the physical and chemical properties of these fibers and the practical household tests that may be given to the woven fabrics to aid in the detection of adulteration, the judging of quality, the care and laundering of the various fabrics, the hygiene of clothing, and the economics of buying.

In the chapter on the economics of clothing are many very valuable suggestions as to when and how to buy. Legitimate reasons for reduced prices are given and the suggestion that, outside of these certain special sale values, the bargain counter should be avoided. Advantages and disadvantages of cash, charge accounts, and installment methods of buying are included in the discussion.

Due to the direct, simple, and untechnical manner in which these subjects are treated, the book cannot fail to be of real value to the homemaker.

IVA BRANDT,
Iowa State College, Ames.

Food Preparation. By BETH WARNER JOSSERAND. Peoria, Ill.: The Manual Arts Press, 1917, pp. (Part I) 148, (Part II) 142. $1.25 each.

Food preparation is described by the publisher as a combined laboratory guide, text book, and notebook for use by high school classes in domestic science.

We agree heartily with the author in her statement that there is often a great loss of time on the part of both teacher and pupil in the dictation and blackboard method of presentation, also that the permanent and well arranged record of laboratory work should be of value to the pupil. This loose leaf book with detailed directions for work and ample space for interlinear observations offers itself as a solution of the problem, and those who have struggled with high school notebooks will welcome its help.

The order of material is somewhat unusual, but, of course, there is no reason why it should be followed exactly in any given school. A much more serious objection can be raised to the fact that in a book entitled Food Preparation it is not until the forty-seventh page that there is any actual handling of food. With a skillful teacher this need not affect the interest of the class, but under some circumstances it would prove disastrous. Chapter one is entitled "Equipment and Rules," but, since rules are only of value when the need for their help arises, would it not be as good pedagogy to put them in the background where they can be called up, one by one, as needed? Even more questionable is the outline of digestive processes in the same chapter which uses nomenclature entirely unfamiliar to the student in discussing substances which she does not know exist.

There are many inaccuracies of statement and some of the material is out of date. For example, one experiment is devoted to proving the presence of albumen in milk by the formation of skin on heating, and the old factors are used in estimating food values. There is a good deal of obvious material included and the list of utensils given at the head of each lesson seems unnecessary for high school students.

In spite of the difficulties which would arise in attempting to depend on the book as a text, there remain the advantages which it offers as laboratory guide and note book. In the hands of a teacher who knows how to use it, the book should prove very helpful.

FRANCES L. SWAIN,
Chicago Normal College.

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Hiding the Unsightly Fixture. *House and Garden*, Feb., 1919.

Reconstruction and the useful Arts. Henry W. Frohne, *Country Life*, Feb., 1919.

Manual Training for Elementary Grades—Rush Seating. Edw. F. Worst, *School Arts*, Feb., 1919.

The History of Wall Paper as a Decoration. Edw. U. Dunn, *Decorative Furnisher*, Feb., 1919.

Gothic and Tudor Furniture. Walter A. Dyer, *Country Life*, Feb., 1919.

The Colonial Idea in Modern Furniture. Margaret Meade, *Touchstone*, Feb., 1919.

Colonial Antiques of Distinction. *House and Garden*, Feb., 1919.

"The Styles of Charles II, William and Mary, and Queen Anne." *Art World and Arts and Decoration*, Jan., 1919.

The French Periods and Their Application to the Decoration of American Homes. Heittex, *Art World and Arts and Decoration*, Jan., 1918.

The Versatility of Screens. Nancy Ashton, *House and Garden*, Feb., 1919.

Doors and Shutters of the Colonial Period. H. D. Eberlein, *House and Garden*, Feb., 1919.

The Panelings at a Glance, *House and Garden*, Feb., 1919.

The Use of Wall Board in Construction. Florence B. Ellis, *School Arts*, Feb., 1919.

NEWS FROM THE FIELD

The Meeting of the American Home Economics Association, held in Chicago in connection with the Department of Superintendence, N. E. A., February 28–March 1, 1919, was well attended, with from 200 to 250 present at each session, and 179 registrations filed.

The program presented by the Program Committee, Mrs. Henrietta Calvin, chairman, covered on the first day several of the main topics that are of especial immediate interest—child welfare, thrift, Americanization, social rehabilitation. The morning session was presided over by Miss Jenny Snow, Supervisor of Household Arts, Chicago. The opening address by the president, Miss White, outlined the opportunities that are before the home economics workers today, and pointed out the way in which those opportunities should be used. The address made each one who heard it feel her individual responsibility, and inspired each one to assume her share of the burden of work. Mrs. Norton, the editor of the JOURNAL, who is for a time with the Savings Division of the Treasury Department helping with its Thrift Campaign, presented the cause of Education in Intelligent Spending. Miss Sally Lucas Jean, Director of Field Work, Child Health Organization, New York City, told of the ways in which that organization is improving the health of the children in New York, and of the practical applications they are making of the teachings of the domestic science teacher. Her speech was full of "human interest."

Dean Talbot of the University of Chicago presided at the afternoon session. The first address was by Miss Breckinridge, who showed some ways in which we may learn from the foreigners quite as much as we can teach them, and who plead for right standards of living, rather than American standards. Miss Winslow showed how home economics workers should be trained for effective social work, and what kind of positions are open to them. Miss Ethelwyn Miller of Iowa State College discussed some of the problems of home economics education. Both papers were discussed.

The general topic for Saturday morning was "Wanted—A Program for the Advancement of Home Economics Education." Miss Snow presented so effectively her plea for changes in the elementary program, and the difficulties in carrying these out, that the Association passed a resolution asking the N. E. A to put her on their general program at their annual meeting, to give the same address. Miss Carlotta Greer of the East Technical High School, Cleveland, Ohio, presented some high school problems, and Miss Grace Schermerhorn, Director of Cooking, Department of Education, New York City, outlined the school lunch work in New York, and its possibilities. Mr. George B. Masslich, Principal of the Wells School, Chicago, gave a vivid account of some experiments in that school on a penny portion lunch, and on a school savings bank. Dr. Foght, of the Bureau of Education, Washington, who was not able to be present on Friday as announced, made an address on Education of Women for Rural Life.

The afternoon session dealt with Relationships. Those between the Smith-Hughes State Supervisor and the City Supervisor were shown by Mrs. Martha French, State Supervisor of Home Economics for Michigan; those between the Urban Extension Worker and the City School Supervisor by Miss Gertrude Van Hoesen of the Office of Extension Work, North and West, Department of Agriculture; and the relation between Home Economics and Public Health by Miss Emma Wardall, University of Illinois. Through the discussion of papers both morning and afternoon, an opportunity was given for the audience to become

acquainted with many of the well known leaders in home economics who were not on the formal program.

The meetings were distinguished by their breadth of interest. Great appreciation was expressed for the addresses given, and the whole planning of the program. Two meetings of the Council were held.

The Association was entertained at tea on Friday afternoon by the Ella Flagg Young Club at the rooms of the Chicago Woman's Club. On Friday evening, through the courtesy of Dr. Blunt, the Association met for dinner at the College Club.

Omicron Nu News. *Alpha.* This year we have found it an excellent plan to have a combination of social, literary, and business meetings every two weeks. We listen to the reading of a good article or short story and discuss society matters. This brings us in closer touch with each other and helps to keep up a strong interest in the aims and purposes of Omicron Nu.

On February twelfth we initiated eight new members,—six juniors, one senior, and one faculty member.

Epsilon. When the United War Fund Campaign was in progress, Epsilon girls subscribed three-fourths of the amount of money in their treasury, about $10.

During the influenza epidemic, the girls were busy in the emergency hospitals. While the home economics faculty and girls did much of the work, they were aided by other university women.

Gamma. In the main hall of the home economics building there has been placed a glass case, seven feet by four. Across the back is hung a large banner in the fraternity colors. Standing upright in the center is a gilded cardboard representation of our badge. Open copies of the constitution are also in the case, together with our ribbons.

Gamma chapter believes that this display will make underclass girls more familiar with the standards, aims, and purposes of Omicron Nu.

Beta. According to custom, a tea for the purpose of acquainting home economics freshmen with Omicron Nu was held at the Practice House, the faculty and active members acting as hostesses.

Our work for the year in Beta chapter has been divided into three phases: educational, social, and financial. We are endeavoring to familiarize ourselves with home economics and its many opportunities. At our meetings each member responds to roll call with a current event concerning home economics. In addition, each member is responsible for a report on some particular magazine of interest and importance to home economics.

There is now under discussion a plan for adopting one or more Belgian or French orphan babies. Our finance committee has already purchased a Liberty Bond and War Savings Stamps. Funds have been obtained by a series of sales of popcorn, ice cream, and cocoa.